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ITALIAN ANTHROPOLOGY.—Two original memoirs appear in the Archivio, Vol. XI, Fasc. 1:

Maestrelli, Dr.—The exponent of vital capacity.
Amadeè, Dr. Giuseppe—Numerical anomalies in the human dental system.

GEOLOGY AND PALÆONTOLOGY.

A NEW TYPE OF PERISSODACTYLA.—In a paper on the "homologies and origin of the molar teeth of the Mammalia Educabilia, published in March, 1874,[1] I ventured the generalization that the primitive types of the Ungulata would be discovered to be characterized by the possession of five-toed plantigrade feet, and tubercular teeth. No Perissodactyle or Artiodactyle mammal was known at that time to possess such feet, nor was any Perissodactyle known to possess tubercular teeth. Shortly after advancing the above hypothesis, I discovered the foot structure of *Coryphodon*, which is five-toed and plantigrade, but the teeth are not of the tubercular type. For this and allied genera, I defined a new order, the *Amblypoda*, and I have published the confident anticipation that genera would be discovered which should possess tubercular (bunodont) teeth. This prediction has not yet been realized. I now, however, record a discovery, which goes far towards satisfying the generalization first mentioned, and indicates that the realization of the prophecy respecting the *Amblypoda*, is only a question of time.

In 1873,[2] I described from teeth alone, a genus under the name of *Phenacodus*, and although a good many specimens of the dentition have come into my possession since that date, I have never been able to assign the genus its true position in the mammalian class. The teeth resemble those of suilline Ungulates, but I have never had sufficient evidence to permit its reference to that group. Allied genera recently discovered by me, have been stated to have a hog-like dentition, but that their position could not be determined until the structure of the feet shall have been ascertained.

In his recent explorations in the Wasatch Eocene of Wyoming, Mr. J. L. Wortman was fortunate enough to discover a nearly entire skeleton of a *Phenacodus* very near the typical *P. primævus*, which presents all the characters essential to a full determination of its place in the system. The unexpected result is, that this genus must be referred to the order *Perissodactyla*, and that, with its allies, it must form a special division of that order corresponding in the tubercular characters of its teeth with the bunodont or suilline division of the *Artiodactyla*. In this character, however, there is a closer gradation than in the case of the *Artiodactyla*, and it would scarcely be necessary to create such a group on that character alone. But the genus differs further from the *Perissodactyla* and approaches the *Proboscidia*, in the fact that the astragalus articulates with the navicular only, and by a universally convex surface, as in the Carnivora.

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[1] Journal of the Academy of Natural Sciences Philadelphia.

[2] Palæontological Bulletin No. 17, Oct., 1873, p. 3; also, Report G. M. Wheeler, U. S. Engineers Expl. W. 100 Mer., iv, p. 174—1877.

The astragalus resembles that of the latter order very closely, and differs from that of *Hyracotherium* and the nearest forms among the *Perissodactyla*. *Phenacodus* has moreover five well developed toes on all the feet, and was probably not entirely plantigrade. The cast of the brain case shows that the celebral hemispheres were quite small and nearly smooth, and that the very large cerebellum and olfactory lobes were entirely uncovered by them. The bones of the two carpal rows alternate with each other, and there is a large third trochanter of the femur. The cervical vertebræ are opisthocœlous. The systematic position of the genus may be schematically represented as follows :

Order PERISSODACTYLA ; ungulate; digits of unequal lengths; carpal bones alternating; a postglenoid process. Astragalus with proximal trochlea, and without distal double ginglymus.

Suborder *Diplarthra*; astragalus distally plane or concave in one direction, and uniting with both navicular and cuboid bones; a third trochanter of the femur. The known families belong here.

Suborder *Condylarthra;* astragalus convex in all directions distally, only uniting with navicular bone; a third trochanter of femur.

Family *Phenacodontidæ*. Molar teeth tubercular; the premolar teeth different from the molars; five digits on all the feet.

Genera; *Phenacodus* Cope, and very probably *Catathlæus*,[1] *Mioclænus*, and *Protogonia*[2] Cope, and perhaps also *Anisonchus* Cope. These genera include fifteen species, all from the lower Eocene beds. The Condylarthra are then the ancestral type of the known *Perissodactyla*, that is of the horses, tapirs and rhinoceroses, and of the numerous extinct forms.—*E. D. Cope.*

NEW GENUS OF PERISSODACTYLA DIPLARTHRA.—Good specimens of the *Hyracotherium tapirinum* Cope, show that the superior dentition is uninterrupted from the canine inclusive. It thus differs from *Hyracotherium* which has one or two diastemata. The fourth inferior premolar is like the third premolar. The *H. tapirinum* may then be referred to a new genus under the name *Systemodon.*—*E. D. Cope.*

NOTES ON CREODONTA.—A fine series of specimens of *Mesonyx* demonstrates the following points: (1) Pachyæna was founded on a superior molar of *Mesonyx*, and must be suppressed. (2) Apterodon Fischer, is the same as *Mesonyx*. (3) *Mesonyx*

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[1] AMERICAN NATURALIST, October, 1880.

[2] Proceedings Amer. Philosoph. Soc., September, 1881.

navajovius Cope[1] must be separated as a distinct genus, since the apices of the crowns of the last two molars have two cusps. This genus may be called *Dissacus.* (4) It results that there are four species of *Mesonyx: M. ossifragus* Cope, *M. lanius* Cope, *M. obtusidens* Cope, and *M. gaudryi* Fisch. *M. ossifragus* was the largest Creodont of the Eocene, equaling the largest grizzly bear in the size of its skull.

The number of possible combinations of tubercular and tubercular-sectorial molar teeth is considerable, and many of them are represented in the genera of the *Creodonta.* A new one must now be added, in a genus which has, in the lower jaw, two tubercular sectorials, and one tubercular posterior to them. The genus thus stands between *Stypolophus* and *Didymictis*, but is nearer the former than the latter, since it has three true molars. It differs further from both in having but three premolars and a wide diastema. The canine is well developed. I call the genus *Lipodectes*, and describe two species, both from the Lowest Eocene, probably Puerco, of New Mexico.

Lipodectes penetrans, sp. nov., represented by a left mandibular ramus with three of the molars preserved. The last has a long heel; the first and second true molars are alike, and resemble those of *Triïsodon*, but the appendicular cusps are better developed. The anterior inner cusp is, however, smaller than the others and is nearly median in position. The heel is elevated on its external border into a strong triangular cusp. The posterior border rises into an acute cusp, which is internal to the middle line. The internal border of the heel is not elevated, and the surface is the oblique inner face of the external cusp. The anterior cusps are only moderately elevated and the cusps are acute. The enamel is smooth, and there is a low cingulum on the external base. The first (second) premolar is two-rooted, and has a large base. The second (third) consists principally of an elevated cusp with a subtriangular section. The heel is very small and acute, and there is no anterior basal tubercle. The internal face is strongly grooved in front. Canines directed upwards, with robust base. Symphysis short. Length of molar series, .043; of premolars, .019; of diastema, .012; length of base of last molar, .010; do of canine, .007; depth of ramus at last molar, .018; of diastema, .015. As large as, but more robust, than the red fox.

Lipodectes pelvidens. This species is about the size of *L. penetrans*, and differs from it in the less carnassial character of the inferior molars. The anterior cusps are relatively smaller in every way, and are more distinctly separated by deeper emarginations. The heel is wider, and has a less elongated external marginal cusp. The inner margin of the heel is elevated, enclosing a basin-like fossa, and rises into a flat cusp posteriorly. There is a small median posterior marginal tubercle, which runs into a posterior cingulum, and is wanting from the *L. penetrans*. The tubercular has the three anterior cusps distinct as in *Didymictis* sp., while the heel is longer than in the known species of that genus. Its external border rises into a prominent cusp with triangular base. The fourth premolar has a small heel on the inner posterior side, and an acute anterior basal cusp. The principal cusp is robust and the basal portion is widely grooved posteriorly (apex lost). True molars with an external cingulum. Enamel obsoletely wrinkled. Length of true molar series, .024; of fourth premolar, .0075; length of last molar, .008; width of heel of second true molar, .005; length of crown of do., .007.—*E. D. Cope.*

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[1] Palæontological Bulletin, No. 33, p. 454.

THE PERMIAN FORMATION OF NEW MEXICO.—This formation is richly fossiliferous in New Mexico, and the vertebrates include several of the types already known from Texas and Illinois. Such are, among reptiles, the genera *Diadectes*, *Dimetrodon* and probably *Clepsydrops*. Of batrachians there are two genera, *Eryops*, and what is probably *Zatrachys*. *Diplodus* represents the fishes. All the individuals, and hence, probably, the species, are of smaller size than those of the Texan Permian, resembling in this respect those found in Illinois. Two species of batrachians of the genera above mentioned, are new, and may be described as follows:

Eryops reticulatus.—The most prominent peculiarity of this species is seen in the neural spines, which are not expanded at the summit as in *E. megacephalus*, but have rather contracted apices. Another character is the sharply reticulate sculpture of the maxillary bones. The species is much smaller than the *E. megacephalus*, or even than the *Trimerorhachis insignis*, and the extent of ossification of the vertebral elements is intermediate between the two species. The inferior surfaces of the intercentra are smooth, and the diapophyses are compressed. The occipital condyles are depressed and not very well distinguished inferiorly. The humeri have expanded extremities with enlarged epicondyles and well developed condyles, and no epitrochlear foramen. Width of occipital condyles, m. .016; elevation of dorsal vertebra, .024; width of intercentrum, .011; length of intercentrum (below), .007; five maxillary teeth in .015.

Zatrachys apicalis.—Represented by vertebræ and dermal bones. The summits of the neural spines are expanded, and the superior faces of the expansions are tubercular and have a median prominence. The expansions are sometimes large, resembling the dermal bones of crocodiles, and in that case the median prominence is a keel. On the smaller expansions the latter is a mere apex. There are narrow flat bones which I suppose to be neural spines, which are ornamented with inosculating ridges. A capitular head of a diapophysis is compressed. Intercentra well ossified, those preserved without lateral notch. Inferior surface with crowded small fossæ, giving a delicate reticulate relief. Length of an intercentrum, .013; width of do., .014; width of the summit of a neural spine, .020; length of do., .014; width of a second do, .025; length of do., 015; width of a third (two unite), .034; length of do., .039. The reference of this species is provisional only. It is much larger than the *Z. serratus*.—*E. D. Cope.*

NEW CARBONIFEROUS FOSSILS IN SCOTLAND.—In a recent number of *Nature*, Professor Geikie describes a remarkable discovery of fossils in Scotland. The present hoard has been found among that range of hills or uplands familiar to travelers who enter Scotland from the south, which form a barrier between the valleys of the border on the one hand and the Scottish lowlands on the other. This belt of pastoral high grounds has a special interest for the geologist; he can trace it back to its origin about the close of the Silurian period; and since the old red sandstone, notwithstanding submergence, elevation, and denudation, the ridge has continued to form a barrier between the basins on its northern and southern margin. During every part of the carboniferous period these southern uplands of Scotland formed a barrier between the lagoons of the lowlands and the more open waters to the south which spread over the north and centre of England. For some years past the Geological Survey of Scotland, has been engaged in the detailed investigation of the carboniferous rocks between the Silurian uplands and the English border. In the course of the work, one particular zone of shale on the banks of the River Esk, has been found to possess extraordinary palæontological value. From this stratum, where exposed for a few square yards by the edge of the river, a larger number of new organisms has been exhumed by the Survey than has been obtained from the entire carboniferous system of Scotland for years past. As a whole, the remains are in an excellent state of preservation. Indeed, in some instances they have been so admirably wrapped up in their matrix of fine clay as to retain structures which have never before been recognized in a fossile state. The more important treasures from the shales of Eskdale and Liddesdale are fishes, crustaceans, and arachnids. Dr. R. H. Traquair, the eminent palæontologist, in his report on the fossils, points out the extraordinary interest of the collection, both as opening up an almost entirely new fish fauna, and as revealing remarkable peculiarities in the structure of many of the new forms. Out of 28 species of ganoids, no fewer than 20, at least, are new. Of the 16 genera in which these species are comprised, five are now for the first time added to science, of which one (Tarrasius) is altogether so peculiar that no place can be found for it in any known family. The common forms of the Lothians are conspicuous by their absence in Eskdale and Liddesdale. These facts suggest interesting problems in carboniferous geography and in ancient zoölogical distribution. Associated with the skeletons of the fishes are the remains of some new phyllopod and decapod crustaceans, which have been worked out by Mr. B. N. Peach, the acting palæontologist to the society. One of the most interesting features of this great find, however, is the abundant and often admirably preserved specimens of scorpions, which have enabled Mr. Peach to work out in detail the structure of this interesting creature, doubtless the father of all spiders. In anticipation of the publication of Mr. Peach's descriptions, Professor Geikie gives some notes on the subject. Mr. Peach finds that these palæozoic forms differ in no essential respect from the living scorpion so far as regards external organs. He has recognized in them every structure of the recent form, down even to hairs and hooks on the feet. The sting alone has not been certainly observed, but that it existed may be inferred from the presence of the poison-gland which Mr. Peach has detected in the fossil state. The chief difference between the living scorpion and its ancient progenitors, lies in the fact that in the fossil forms the mesial eyes are much larger in proportion to the lateral ones, and also to the size of the whole animal. The two mesial eyes are placed on an eminence near the anterior margin of the carapace formed by two converging tubes, and so arranged that the creature could look with them upwards, outwards and forwards. There are at least four lateral eyes on each side. The mandibles, palpi and four pairs of walking legs are beautifully distinct on many specimens. The combs are much like those of the modern scorpion, but with a very remarkable sculpturing which at once recalls that so characteristic of the Eurypterids. As regards theories of descent, these fossils afford no more help in tracing the pedigree of the scorpion than is furnished by the living form. There can be little doubt that the scorpion is the most ancient type of arachnid, whence the others have been derived.—*London Times*.

STEGOCEPHALI IN SAXONY.—Fossil remains of several species of *Stegocephali* have been discovered in the neighborhood of Dresden, Germany. Professor Credner, of Leipzic, publishes in the Zeitschrift of the Deutschen Geologischen Gesselschaft for 1881, a first installment of descriptions of the species. This includes the *Branchiosaurus gracilis* Credner, which is represented by several well preserved skeletons. *Branchiosaurus* belongs to the "Microsaurian" subdivision.

FOSSIL ORGANISMS IN METEORITES—Dr. O. Hahn, who will be remembered for the part he took in the "Eozoön" controversy, claims to have established the existence of fossil organisms in sections of meteorites, and his views have been confirmed by Professor Karsten and Dr. D. F. Weinland, the former of whom recognized vegetable forms, while Dr. Hahn was only able to find animal organisms. To enable a better judgment to be formed by the preparations made by Dr. Hahn, 32 photo-lithographic plates are given of 142 transparent sections. Dr. Weinland estimates that there are fifty various species of polyps, crinoids and algæ in Dr. Hahn's preparations.

"These 'celestial fossils' tell us of a planet on which aquatic life was sufficiently developed to produce them and to preserve them after death by a process of infiltration with siliceous material which dissolved the lime of which their structure must have consisted, as far as their inorganic constituents are concerned, and supplanted it by the various kinds of siliceous materials, filling up also the interstices and openings which had formerly contained organic substance. This planet, therefore, must have had a comparatively long period of existence; it must have had an atmosphere, and its surface must in whole or in part have been covered by water. Since bacteria are known to be able to withstand a temperature of 100° C., without losing vitality, the Thomson-Richter hypothesis of the propagation of life through the universe becomes almost a tangible reality."

It is nevertheless extremely probable that Dr. Hahn and friends have been deceived, and a great deal more evidence will be required by biologists before crediting these alleged discoveries. —*Eds.*

GEOLOGICAL NEWS.—Professor J. W. Dawson has had a fine series of photographs executed which represent the *Batrachia* of the Coal measures of Nova Scotia, some of them new species. One of the latter is referred to a new genus, *Fritschia.*——In the Bulletin of the U. S. Geological Survey of the Territories, Professor A. S. Packard, Jr., discusses the extinct craw-fishes.——In the same, Professor Cope reviews the osteology of the *Rodentia* of the Miocene period of North America.——In this Bulletin also, the same author describes some of the *Canidæ* of the Loup Fork formation. He shows that the genus *Ælurodon* belongs to that family, and describes the *Æ. hyænoides* as new. *Canis brachypus* is a new species from the Ticholeptus beds.——At the late meeting of the British Association for the Advancement of Science, Dr. H. G. Seeley described the characteristics of the Plesiosauroid genus *Simosaurus.* He finds that while the anterior feet are adapted for swimming, as in *Plesiosaurus*, the posterior ones are adapted for progression on land, having curved claws. He thinks that the genus represents a transition between terrestrial and aquatic types, and that the origin of *Plesiosaurus* from a land reptile is thus clearly indicated. This reminds us of the *Neustosaurus gigondarum* of Raspail, described in 1842, which was said to have a similar structure, and which, Professor Bronn remarked in Lethæa Geognostica, "ist nicht zu glauben ohne zu sehen!"